

EXPLORING THE DESIGN POTENTIAL OF BAMBOO FOR CONTEMPORARY FURNITURE



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the degree of Master of Design

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DECLARATION

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Erika Kusumawardhani

30 March 2010

DEDICATION

I would like to acknowledge the following people for their help and support in realizing this body of work:

- My Supervisor Ross McLeod and the Furniture Laboratory department for their ongoing support;
- Kjell Grant for his encouragement of designing processes;
- Javanese traditional artisans;
- My parents and family for their assistance in set up the export import processes of the 3 pieces of furniture objects from Indonesia to Australia;
- Suriawati Qiu Chunyang and Jindee Chua for the interview time as a cross cultural designer;
- Stuart Walters for his editorial assistance.
- Friends and colleagues for their assistance and encouragement of the successful developments of this project.

ACKNOWLEDGEMENT

This thesis is dedicated to my family – my dad, my mum and my brother who have supported and inspired be both personally and professionally in my life.

I would also like to acknowledge my supervisors, Ross McLeod and Kjell Grant for challenging and supporting me in this project, and Andrew Thompson, Kevin Mumford and Matthew Morris who have helped in the furniture workshop and CAD CAM laboratory.

Finally, I would like to thank to the Javanese craftspeople and many critical friends and colleagues who gave their ideas, energy and time in cooperating with me to help finish and enrich the project.

ABSTRACT

The project has been conducted as an investigation into the design and making of furniture items, using bamboo in both the context of employing traditional craft skills and modern machinery and technologies.

Initially the project studied bamboos physical properties and its role as an important traditional material within all aspects of Indonesian culture. The study explored the concept of 'cultural hybridization,' a result of Asian and European colonialism in Indonesia and its expression in architecture and furniture. This concept was then used to review the work of contemporary Asian designers that mix traditional materials and craft skills within contemporary furniture forms and was extended to the use of bamboo in contemporary design projects from around the world.

The project was conducted through the development of a number of designs that employed bamboo in innovative ways. Initially concepts, renderings, models and prototypes were developed and techniques for the shaping and construction of a range of bamboo furniture pieces were tested in the workshops within RMIT, using modern computer and machine technologies. The project was then taken back to Java where traditional craftsman were asked to develop techniques to reproduce the designs developed in Melbourne. The 'transfer of knowledge' involved in the interpretation of the products of modern technology that were made in the RMIT workshops, through the application of traditional Javanese craft skills and techniques in Indonesia, has become the core focus of the study.

Ultimately the study seeks to expose the potentials within the bridging of cultures, technologies and skills through the act of design. The project offers a new perspective on the conception of furniture design which uses traditional Javanese culture and skills in combination with modern ideas to create products which fulfil contemporary lifestyle needs.

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This Masters by project focused on the development of a new set of sensibilities and approaches toward the manipulation of bamboo in the design and production of contemporary furniture in Indonesia.

Introduction

Bamboo's strength and elastic properties make it an important traditional material within all aspects of Indonesian culture and ideal for the design and production of a wide range of household objects and furniture. The durability and longevity of bamboo makes it a material that is suitable for the construction of buildings, furniture and everyday items.

While bamboo is recognised as an important aspect of traditional Javanese arts and crafts it has yet to be recognised as a viable material from which to design and produce contemporary furniture items in Indonesia for the international market. This Masters by project focused on the development of a new set of sensibilities and approaches toward the manipulation of bamboo in the design and production of contemporary furniture in Indonesia.

The research began through the exploration of bamboo as a material used by traditional artisans in the manufacture of crafts and furniture and examined the lack of development of bamboo's potential amongst the traditional crafts and furniture industry in Indonesia. It was concluded that an opportunity existed to consider the manipulation of bamboo in different ways through an engagement with the various technologies that have been developed in western industrial practices. It was felt that the adoption of design, construction and fabrication methods common in western furniture design practice could stimulate the development of new ways of thinking about the production of furniture in Indonesia that would integrate aspects of traditional craft and modern manufacturing techniques.

In its undertaking, the project has explored the material properties of bamboo, its use in traditional construction techniques and its potential as a laminated material that can be used as an alternative to scarce timber resources in the production of furniture. Beyond the physical reinterpretation of the material, the research sought to establish an approach to contemporary design which maintains a cultural identity that is particular to Indonesia while addressing the needs and desires of the global market in furniture design. To this end the research explored the concept of 'cultural hybridization', a result of Asian and European colonialism in Indonesia and its expression in architecture and furniture. This concept was used to review the work of contemporary Asian designers that mix traditional materials and craft skills within contemporary furniture forms and was extended to the use of bamboo in contemporary design research from around the world.

These issues were synthesised through the development of a number of contemporary furniture designs that employed bamboo in innovative ways. The research was initially conducted within the RMIT Furniture Laboratory and employed computer aided design, machine technologies and western woodworking techniques to experiment with the limits and potentials of the material. Through this exposure to contemporary western manufacturing, techniques for the cutting, shaping, gluing and joining of laminated bamboo components were developed and a series of concepts, renderings, models and furniture prototypes were produced.

The research was then taken back to Java where traditional craftsman were asked to develop techniques to reproduce the designs developed in Melbourne. The 'transfer of knowledge' involved in the interpretation of the products of modern technology that were made in the RMIT workshops, through the application of traditional Javanese craft skills and techniques in Indonesia, became the core focus of the research. The development of communication techniques between designer and craftspeople was a key issue within this technology transfer.

Through the consideration of western woodworking techniques with traditional Javanese culture and traditional artisans' skills, the research explored the act of furniture design as an expression of cultural hybridization. The research sought to expose the potentials within the bridging of cultures, technologies and skills through the act of design and offer a new perspective on the conception of furniture design which uses traditional Javanese culture and skills in combination with modern ideas to create products which fulfil contemporary lifestyle needs.

Spreading here, spreading there, the grasses on the plain, a cycle, a year of flourishing and decay, wild fires burnt but cannot kill them off, when spring wind blows, they grow again. Faraway fragrance over runs ancient roads, Bright emerald tint spreads to ruined walls. Again it's time to bid you farewell; Lush growth teams with my parting thoughts.¹

Bamboo and its material properties

The world population and global economy are on the increase. The demand for timber is increasing, but the forest reserves are shrinking. The restriction on large consumption of timber is the main reason to seek alternative materials. One such potential material is Bamboo. It is environmentally friendly by being recyclable, renewable and sustainable and is a rapidly renewable material in comparison with timber. Toolbase services makes the comparison:

a sixty foot spruce, pine or fir tree needs twenty five to thirty five years to grow to full height while a one hundred twenty foot bamboo such as *Dendrocalamus asper*, known as timber bamboo, needs three to six years to grow to full height.²

Bamboos are adaptable plants. The INBAR (International Bamboo and Rattan) organisation has classified bamboo a member of the grass family and it can grow in tropical and subtropical climates. The INBAR organisation notes that many bamboo species are found all over the world and it has been identified that there are around 1100-1500 species within 60 to 90 genera.³

Bamboo's strength and elastic properties make it ideal for the design and production of a wide range of household objects and furniture. The durability and longevity of bamboo makes it a material that is suitable for the construction of buildings, furniture and everyday items, which is well recognized in traditional Javanese culture. The founding of eastern and central Javanese traditional artisan skills began with the manufacture of baskets and furniture as craft objects. These traditional artisans use either home grown bamboo or commercially grown bamboo. Gerbono claims that currently traditional craftspeople produce and market over one hundred and fifty different types of bamboo kitchen products.⁴

Bamboo stalks are elastic and flexible but these characteristics are limited due to the weaknesses of the internodes. The internodes are where the bamboo's branches are positioned on the stalk which is weaker than the main part of the stalk and thus is prone to breakage if over bent. Woven bamboo product artisans use a method of cutting and splitting the bamboo which avoids the nodes; this ensures that the bamboo is more flexible for bending into curved shapes. While the basket weavers craft is quite advanced, traditional bamboo furniture artisans tend to use only the solid and complete stalks of the plant to make furniture items. Their traditional techniques have been transferred from generation to generation without any significant development in their designs of their furniture.



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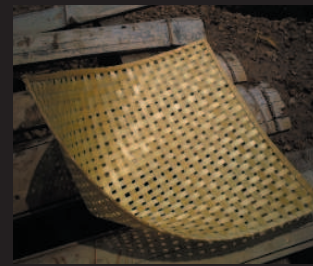


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1. Traditional Bamboo Harvest
2. Home grown bamboo for traditional needs
3. Commercial grown bamboo in traditional markets



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1. Traditional bamboo weaving manufacture
2. Temporary waste basket to collect garden waste
3. Multi purpose basket
4. Traditional bamboo furniture manufacture
5. Traditional bamboo daybed
6. Traditional double seated bamboo couch

There are only a few varieties of bamboo that can be developed as a suitable material for furniture and interior artefacts. Some bamboo species are used for design of furniture because of the attractiveness of their stalk's exterior such as *Gigantochloa atrovioleacea* (black bamboo) and *Bambusa maculata* (spotted bamboo). This research has focused on the use of two species which are easy to locate and cultivate in Indonesia. According to INBAR:

Dendrocalamus asper whose stalk consists of a hollow tube with an external diameter of 1.5 centimetres and overall diameter of twenty centimetres with intervals of forty to sixty centimetres between the nodes and is capable of growing up to twenty to thirty meters. *Gigantochloa apus* has longer gaps between the nodes, a larger diameter, is more elastic, has straighter poles and is easier to split which makes it suitable for making furniture.⁵

Bamboo is an established material for traditional building and construction throughout Asia. In traditional construction techniques when two pieces of bamboo pass each other, they can be lashed together with woven fibers – coconut fiber, hemp jute or linen. Goldberg gives an example that “the bamboo builders in Pacific Rim countries lash their bamboo joins with materials made from natural fibers such as coconut fiber called “tali” as used by the Balinese.”⁶ However, the main problem with this type of joinery system is that these fibers become less secure and deteriorate when exposed to the elements. The tying of joins with fibers is not strong or durable enough as the joins weaken over time due to the fibers becoming loosened, stretched, and brittle. Some joinery systems that are more weather resistant are those lashed with plastic and rubber in the forms of bands, strips and hosing. Goldberg also notes “bamboo joins can also be bolted together with stainless steel and electric conduits that are split in half.”⁷ Bamboo has been used for traditional bamboo furniture which uses natural round or split bamboo. Traditional artisans produce limited types of bamboo products such as chairs, tables, stools and screens. The quality of their products is low because they are still using traditional joinery systems.



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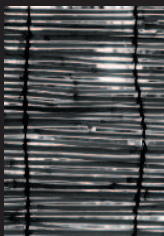
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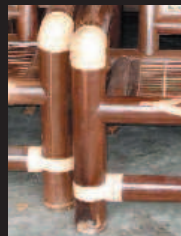
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1. *Bambusa maculata*
2. *Gigantochloa atrovioacea*
3. *Dendrocalamus asper*
4. *Gigantochloa apus*
5. Bamboo lashes with jute
6. Bamboo lashes with coconut fiber
7. Bamboo lashes with rattan

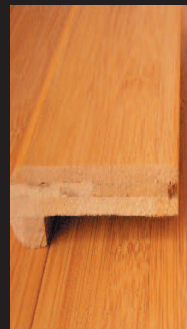
While the development of resources and industries in Indonesia are still far from ideal, bamboo has the global potential to provide an alternative renewable and sustainable material source. In the last ten years bamboo has been explored as possible substitution for scarce timber resources. According to Lee, “technologies for the milling and processing of bamboo have played an important role in this development, as seen in the methods employed in the laminating of bamboo to produce a substitution for timber for interior flooring.”⁸ He also believes that bamboo flooring is a quality product that can be used widely, and has a large, global, consumer market.⁹ As well as developments in bamboo flooring a new type of furniture has evolved in recent years, that uses glue-laminated bamboo panels which retain the distinct physical, mechanical, chemical, environmental and aesthetic features of round or split bamboo. The laminating process improves the quality of bamboo in terms of its increased strength, higher density, lower shrinkages and dimensional stability to that of laminated timber.



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1&2. The surface of bamboo flooring

3. Bamboo flooring

4. Laminated bamboo lumber

5. Laminate bamboo platform

6. Bamboo laminated chop board

A globalized world, while it will alter or disrupt many particular cultures, will provide considerable support for innovation and creative human energies. Creative artistic production usually relies on highly complex support networks. In a cultural network, numerous complementary factors augment each other's effectiveness. In particular, trade may affect societal ethos and worldview, technology, the geographic clustering of production, and the degree of customer concern for quality.¹⁰

Issues within Contemporary furniture

In considering the development of furniture pieces that would traverse the craft traditions of Indonesia and the needs of a contemporary global market place the project researched the concept of contemporary furniture and its development in the twentieth century and particularly focused upon the craft practices and aesthetics developed in Scandinavian furniture design.

The dominant design theory of the early twentieth century was fuelled by modernism with its roots firmly based in manufacturing and social issues. Modern Classic Furniture was an icon of elegance and sophistication. Industrialisation and standardisation of manufacturing processes was oriented as its production philosophy. Sparke quotes, “standardisation was balanced carefully against the need of aesthetic variation and individualism – a delicate task that necessitated a sensitive integration of design into the production process.”¹¹

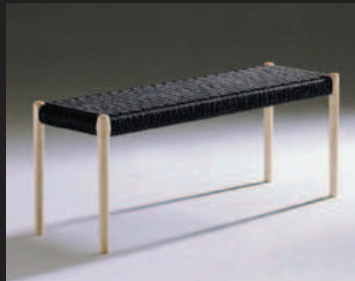
The reconciliation between craft and industrial production can be seen in Scandinavian designs which sought to improve the quality of life through functionality, truth to the materials, clean lines, minimal ornamentation, flawless craftsmanship and affectionate functionality. According to Raizman “An effective compromise between individuality and the perpetuation of crafts traditions on the one hand and standardization of modern industrial manufacturing methods and materials on the other were already becoming identified as ‘Scandinavian’ modernism in the mid-1930s”.¹² The use of natural materials to create a classically elegant but very contemporary style is the basis of Scandinavian design, the furniture relies heavily on traditional craft principles and is solidly built, ergonomically sound and visually pleasing. Pile believes that Scandinavian designs cautious advance took place through its strong roots in traditions and craftsmanship and wise use of materials,¹³ such a description could be equally applied to the conditions within Indonesia and the connection of its craft tradition with its enduring culture and access to a sustainable material resource in bamboo.

In a modern world where goods are increasingly being produced thousands of kilometres from where they are consumed, and where industrial efficiency is often valued more than traditional know-how, the skills and knowledge of traditional artisans faces many challenges. Mass production, whether on the level of large multinational corporations or local home industries, is often able to supply goods needed for daily life at a lower cost than to that of hand-made production, and often craftspeople cannot adapt readily to this competition from mass production. Many craft skills are dependent on particular natural resources that may be increasingly difficult to acquire as climatic and environmental changes or conversion of land to agricultural purposes reduces forest reserves.

The modern lifestyle and its demands that people live fast, functional, and efficient lives is supported and made possible by technology and industrialisation. The symbol of this modern spirit is one of clean lines and simple shapes, a stripped back, functional and machine made aesthetic. The development of the design of contemporary furniture for living spaces in developed countries requires a high quality standard of furniture that is aesthetically pleasing and comfortable, which functions efficiently, ensures a user's safety and is readily available.

Despite the development of a globalised and industrialised contemporary world, it is felt that beautiful and authentic everyday objects will become increasingly valid in the future, as the need for environmentally and culturally sustainable design solutions becomes ever more essential. High quality craft skills and design sensibilities are still highly valued in the development of contemporary design and have come to represent the notion of 'good design'. The object that is manufactured in a specialist workshop implies a special aesthetic culture. Jensen claims, "the designers from Scandinavian countries have long understood that an overtly industrial aesthetic can be alienating, and have therefore sought to develop products that are fundamentally humanizing – products that put man first, then the machine."¹⁴

Recently, the use of bamboo as contemporary material in furniture production is beginning to be recognised. The work of contemporary furniture designer Maria Yee uses bamboo, which she grows in her own plantation in California, to create highly individual one off pieces. Her practice is based on the striking beauty and skilful craftsmanship of Ming Dynasty constructed furnishings, where the pieces are fitted together so precisely that no nails or screws are needed. Maria Yee breathes new life into classic craftsmanship by innovating time-honoured joinery techniques to produce furnishings in a modern manufacturing environment. Her philosophy is one of environmental responsibility. Maria declares that "if we take something from the earth, we should give back to the earth."¹⁵



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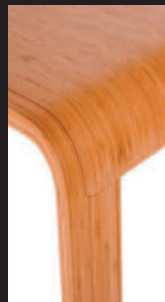
1. Moller chair by N.O Moller (1963)
2. Stool three legs by Artek (1932-1933)
3. Paimio chair by Artek (1931-1932)
4. Lounge chair by Artek (1936)
5. Chaise longue by Artek (1936-1937)

While Yee's work is that of a dedicated craftsman pieces such as the Bambu range by Artek, designed by Henrik Tjaerby, use plywood techniques developed by Alvar Aalto in the nineteen thirties, and applies them to the use of bamboo. Although they are produced using the industrial processes of large scale manufacturing these pieces claim a dialogue with ethical and aesthetical values. They believe that a contemporary humane approach in the discussion of sustainability, culture and technology.¹⁶

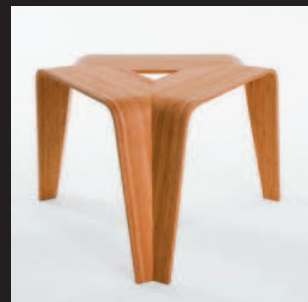
Both these examples of contemporary furniture design practice highlight issues of links with craft traditions and a respect for the material and resources used in production. The value of rich relationships from other times and places translates into beautiful contemporary furniture designs in this technological age. The design aesthetic is one that has universal appeal, which is enhanced by the materials. A creative dialogue is generated between the combining of modern and traditional aesthetics and imbuing the works with contemporary values that seek to sustain cultural, environmental and social aspects.



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1. Bamboo Chair and Table by Artek Studio
2. Laminated bamboo furniture by Artek Studio
3. Bamboo side table by Artek Studio
4. Ridge bamboo end table by Maria Yee
5. Ridge bamboo by Maria Yee

Authenticity and hybridity are not opposites but are natural extensions of each other. Hybridity produces new forms of authenticity and is inherent in processes of social and cultural dynamics in which various cultures confront each other.¹⁷

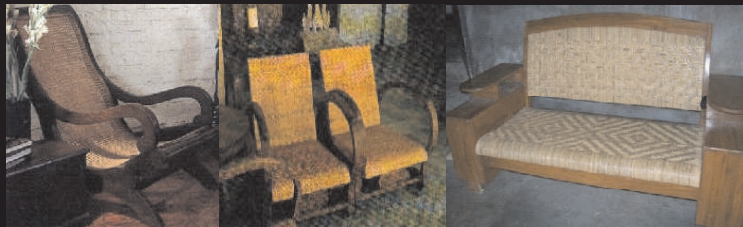
Cultural Hybridization

Cultural tradition is not static. Its changes are both subtle and apparent from time to time. Feldman illustrates that cultural hybridity is the active adoption and intermixing of particular elements derived from various cultures that defines artistic traditions in a manner that blur the merits amongst relatively obvious traditions¹⁸ and the concept of hybridity is essentially bound up with cultural identity. Cultural hybridization offers an analytical tool that has its emphasis on interaction and counteraction; it draws attention to differences while blending together. With the spread of globalisation, there is an apparent shift in the idea of nationality and what it is that specifically characterizes the various nations. According to Conrad, "Multiculturalism and cross cultural networks have promoted highly diverse and hybrid design practices."¹⁹

Graber believes that Asian cultures owe much to influences from neighbouring countries, foreign trading communities and colonial powers.²⁰ Indonesia is comprised of hundreds of different ethnic groups which have adapted to the influences of foreign cultures and governances over many centuries. The influence of the diverse ethnic groups has had a profound affect on the architectural and design styles of the country and its cultural development.

When Buddhism and Hinduism expanded into Indonesia, the bamboo basket became recognizable as a part of ritual ceremonies. Many artefacts of Hindu and Buddhist ceremony have been found in several religious buildings from the ancient Javanese civilization period. Rahardjo states, "Hindu and Buddhist artefacts included woven household items made from bamboo which were mainly used to contain foods, fruits and flowers as oblations to the temple."²¹ The Buddhist monks who came to Indonesia mainly came from China and the Hindu monks came from India. Sachari claims that both countries are well recognized in their way of utilizing bamboo for every day use by their societies over many centuries.²² The initial use of bamboo artefacts in religious rituals in turn influenced the Indonesians themselves to begin to use bamboo as another alternative raw material for crafts.

Many centuries later, according to Sachari the colonisation of Indonesia by the Dutch brought European rationalism to several aspects of life such as education, government, trades, urban development, architecture, and arts.²³ He also believes that during this time Dutch colonialists implemented their aggressive imperialism and trade policies which resulted in a strong European influence upon Indonesian traditional culture.²⁴ The growth of the colonial era started to inform the design of objects and furniture that were produced in the period between the eighteenth and twentieth centuries. The styles such as Neoclassical, Rococo, Bauhaus, De Stijl and Art Deco became popular in architectural and furniture designs.



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1. Neoclassical furniture style (Mid 18th century)
2. Rococco furniture style (Mid 18th century)
3. Art Deco furniture style (Early 20th century)
4. Neoclassical furniture style (Mid 18th century)
5. Nirwana Bali Resort's villa, Bali, Indonesia

Sachari notes that Dutch colonialism led to a blend of Javanese and Colonial cultures that can be seen in the mixed designs of households and architecture pieces in Indonesia during the eighteenth century.²⁵ Furniture was introduced as important objects for modern buildings such as offices and official houses. The introduction of 'the chair' during this time represented a significant cultural and social shift, as Indonesian traditional society did not recognize chairs until the expansion of Dutch colonialism. Marizar states, "the chair became a symbol of aristocracy, social status and power within the Javanese empire during the Dutch colonial period."²⁶

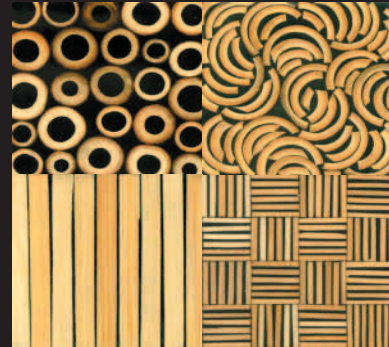
In more recent times, complex eclectic design hybridization between east and west design styles and concerns can be found in resort architecture in Indonesia. Resort architecture and design represents a union of east and west in which Indonesian traditional lifestyles and native culture have been acknowledged and shaped to suit the needs of western tourists who wish to relax in a tropical atmosphere. The resulting spaces are far removed from how Indonesians traditionally live in their dwellings and respond to their environment. The resort is a form of cultural hybrid of traditional and modern architecture and design which takes aspects of one culture and uses them to shape the needs of another.

Recently, designers look toward the global, while at the same time drawing strength and inspiration from their local roots. Designers and craft artists have begun to see the exotic and extraordinary in their own traditions and are designing high quality objects. While not rejecting past traditions, they have learned to produce beautiful contemporary objects in which traditional Asian design styles run parallel to the minimalism of contemporary western design so as to instil a sense of timelessness, harmony and balance.

Two contemporary cross cultural designers who were trained in the west yet base their practices in their native lands are Suriawati from Cush Cush Gallery²⁷ in Bali, Indonesia and Kenneth Cobunpue Designs²⁸ in the Philippines. These designers have developed their ideas by combining native materials and a sense of cultural memory into their contemporary design. They explore modern ideas and concepts through the use of native materials and traditional artisans' skills and in doing so create unique, stunning products that carry a distinctive design identity that is recognised all around the world. These two designers have demonstrated the potentials within the use of native materials and craftsmanship and highlight design as a process which can turn materials that are considered ordinary and humble in their native lands into extraordinary pieces that suit contemporary needs. When this idea of cultural hybridisation is applied to Indonesian furniture design it holds the promise of the creation of a local industry that can express a contemporary aesthetic while retaining a sense of traditional culture, ritual and beauty.



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1. 'Casa' (cabinet made of coconut shell) by Cush Cush Gallery
2. Surfaces design of bamboo by Cush Cush gallery
3. 'Lolah' (easy armchair) by Kenneth Cobonpue
4. 'Lolah' (Buffet cabinet) by Kenneth Cobonpue
5. Yoda sofa by Kenneth Cobonpue

The cultural hybridization that is apparent in these three pieces of furniture has involved the transformation of traditional Indonesian furniture forms into contemporary pieces. The designs of the furniture pieces in this research are customised designs which are handcrafted and distinctive individual pieces.

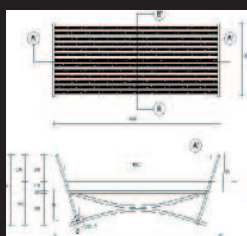
Design Project

The design project developed by approaching the complex environmental and the cultural issues that surround the harvesting and processing of bamboo and the intricacies of producing high quality bamboo furniture with traditional Indonesian artisans. The designs sought to explore the divide between the aesthetics and craft techniques of both Indonesia and the contemporary western world. Through the act of prototyping the pieces, firstly in Melbourne with the aid of modern technology and then subsequently in Indonesia by working with traditional hand-made techniques, the designs needed to bridge two different cultural traditions. In addressing these issues the development of the pieces aimed to create an original approach to the design of contemporary furniture by translating aspects within the form and function of traditional Indonesian furniture into the brief for contemporary furniture. To this end the design project considered the perception of the potentials of bamboo and its material properties, the transformation of bamboo furniture construction techniques from the traditional to the contemporary, ideas of cultural hybridization and issues of authenticity and functionality within contemporary furniture.

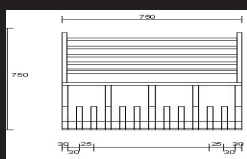
The project initially explored the mix of cultures and furniture forms by considering the traditional Indonesian daybed and seeking ways to transform its form and function into a piece of contemporary furniture. The traditional Indonesian bamboo daybed is made from large solid bamboo stalks. The structural elements are loosely joined and materials such as rattan are entwined and tightened at the joints to create structural strength. The bamboo stalk has a smooth skin while the rattan has rough fibrous character. This furniture form has been produced for centuries, as the knowledge of its construction has been handed down in time from artisan to artisan without any significant technological change in its manufacturing processes.

Everyday furniture in Indonesia provides basic but functional items needed by the general population and is incredibly cheap by western standards. It is produced using lower quality materials and can easily be replaced if it is damaged or broken.

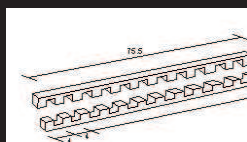
Traditional Javanese furniture however is often more expensive than modern furniture of similar quality. These traditional pieces carry an aesthetic expression of cultures, traditions and histories that are seldom found in modern products. This occurs because this type of furniture has used the first quality of raw materials, highly skilled artisans and extensive time has been taken in their manufacturing.



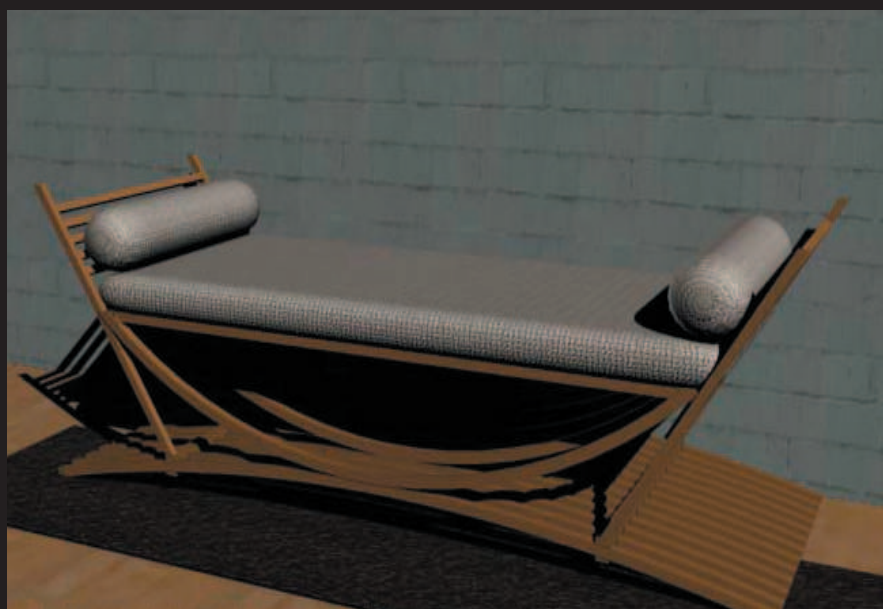
1.a



1.b



1.c



2

1.a, 1.b, 1.c. Contemporary double seated couch (2D sketches and develop in AutoCAD program)

2. Double seated couch design in 3d max program

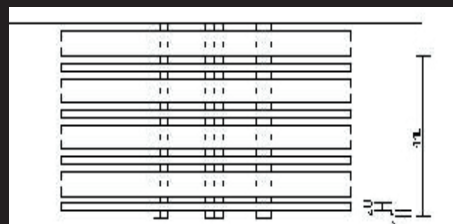
The traditional daybed has several functions such as sitting, sleeping, relaxing and eating. However, in a modern lifestyle these functions are performed by different types of furniture based on the limited space of modern buildings. Through the process of design development, the function of the traditional daybed was translated into two types of contemporary furniture, a double seated couch and a coffee table.

The form of the double seated couch (daybed) design was conceived as being somewhere between a chair and a bed. However the structural elements of its design were no longer massive pieces of raw natural material, instead it utilized the idea of a slender, tensile, structural system that is made possible by the lamination of the bamboo. The aesthetic of the curved and laminated bamboo strip structure is reminiscent of both Javanese veranda spaces and the organic minimalism of Scandinavian design. The use of cushion and roll pillow provides comfort, adaptability and convenience for the user.

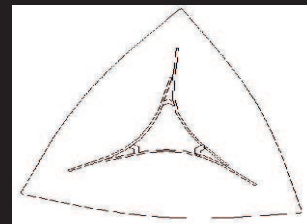
The design of the coffee table was made to accompany the couch, constructed in such a way to make the top of the coffee table level with the seat cushions of the couch. The shape of the laminated bamboo support system and the use of the glass top express the design idea of transforming traditional natural materials and combining them with modern materials to display a new idea for contemporary Javanese style.

The third piece to be designed for the research was a screen/room divider. In traditional Javanese houses, bamboo has long been recognized as a material for a room divider of an outdoor space. The traditional room divider is made by splitting the bamboo into very thin, long strips which are joined by using strings, this allows the room divider to be hung down and rolled up in response to the tropical climate.

In this research, the room divider is used as a substantial furniture form that would clearly define the different parts or functions of an interior space. The concept of this room divider was to assist in the division of rooms that have limited space such as in modern apartment living areas. The slatted design of the room divider was chosen to provide a sense of privacy while maintaining a level of transparency so as to avoid the sense of isolation between the divided areas of the living space. The “s” design shape of the room divider gives the form a degree of fluidity and expresses the flexible character of bamboo.



1.a

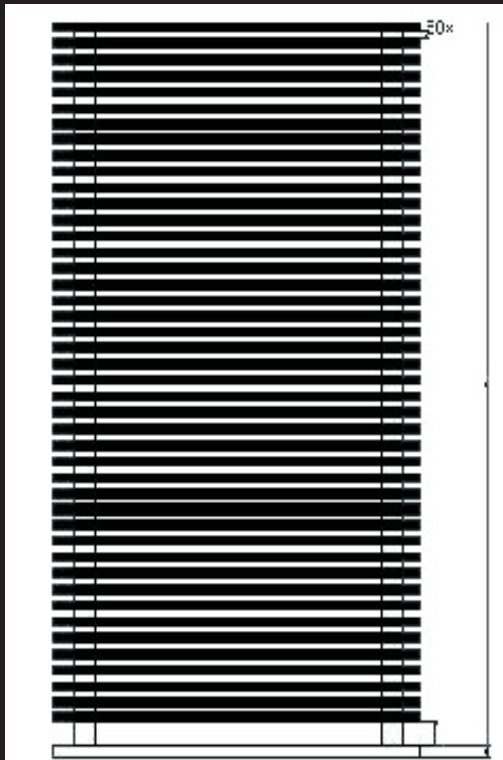


1.b



2

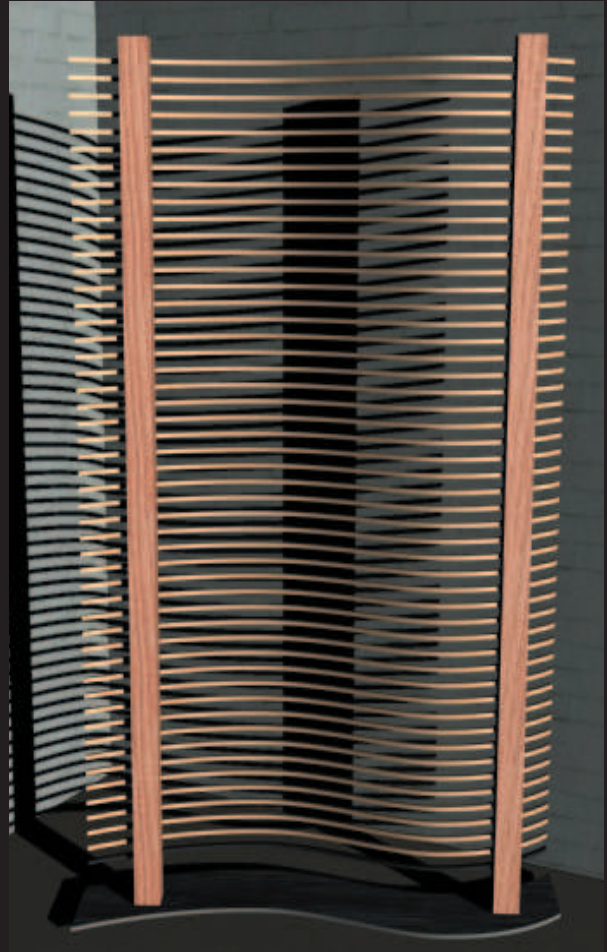
- 1.a & 1.b. Contemporary coffee table design
(2D sketches and develop in AutoCAD program)
2. Coffee table design in 3d max program



1.a



1.b



2

1.a & 1.b. Contemporary room divider design (2D sketches and develop in AutoCAD program)

2. Room divider design in 3d max program

The three pieces of furniture that were designed for the research (coffee table, double seated couch and room divider) are examples of expression of contemporary lifestyle. The cultural hybridization that is apparent in these three pieces of furniture has involved the transformation of traditional Indonesian furniture forms into contemporary pieces. The designs of the furniture pieces in this research are customised designs which are handcrafted and distinctive individual pieces. This idea has been further articulated by the transformation of bamboo into laminated curved components and the adaptation of simple structural forms and detailing that express contemporary aesthetics. The pieces seek to embody a sense of Javanese culture and its traditional lifestyle and crafts in furniture forms that are suited to modern lifestyles.

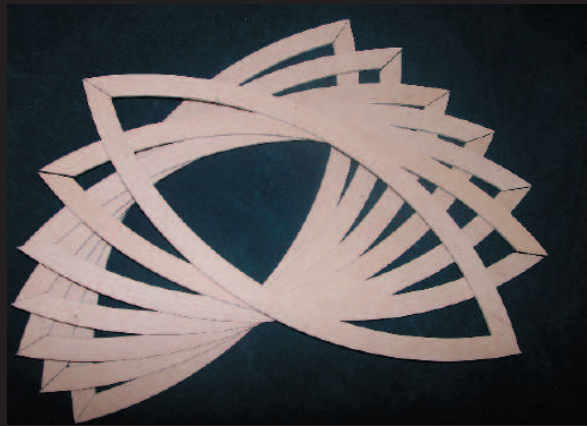
Technology is a continuous attempt to bring the world closer to the way it is to be. Technology is a practice focused on the creation of artefacts and, of increasing importance, artefact-based services. The design process, the structured process leading toward that goal, forms the core of the practice of technology.²⁹

Prototyping in the RMIT Furniture Laboratory

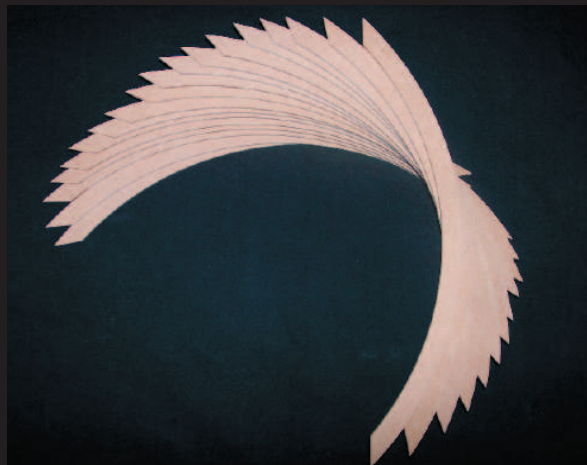
Initial tests, experiments with the laminating of bamboo, the production of a series of scale models of all three pieces and a prototype of the coffee table were first produced in the RMIT Furniture Laboratory. The resources available at the workshops at RMIT focused the nature of the design research and the way which the use of bamboo was approached. The workshops are primarily woodworking based and also have a range of CAD CAM machines and laser cutters. The access to these technologies informed the design and experimentation that was possible with bamboo and made possible an approach to investigating bamboo as a raw material that is vastly different from the techniques currently employed in Indonesia.

The design process began by performing experiments to determine the characteristics of the Bamboo. Small scale models were then developed with Bamboo to create design ideas. The creation of designs was aided by using computer design software, Rhinoceros and 3D Max. This was found to be an important procedure in the design process in term of effectiveness of production processes and time efficiencies. The use of computer design software also helped to create profiles for forms using the CAD CAM routers and laser cutting machines in the workshop at RMIT.

The designs developed in this research utilized the inner part of the bamboo stalk (strips). These strips are considered as a waste product by the traditional bamboo weavers in Java, but have in fact excellent elastic qualities that make them ideal for the production of curved laminated forms. The material properties of the strip of bamboo that are often utilised by the Javanese small industries for creating fences, bamboo walls and chicken cages were explored. In most cases the strip parts of bamboo is often discarded as waste in craft industries. This is because the bamboo plant in Indonesia is not cultivated in a serious way as a raw material for manufacturing industries such as flooring and furniture. The potential of using these often disregarded strips for laminating was a crucial aspect of the project.



1.a



1.b

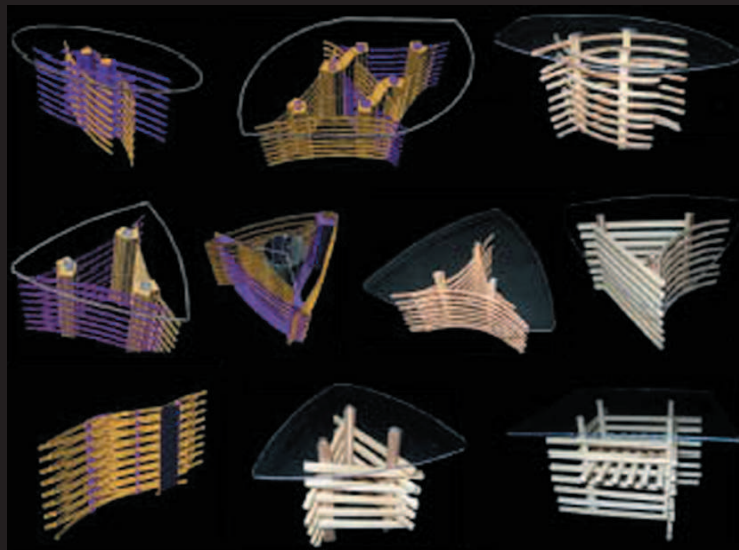
1 & 2. CAD CAM Laboratory experiments by exercising the laser cutter to cut 15 mm MDF



1.a



1.b



2

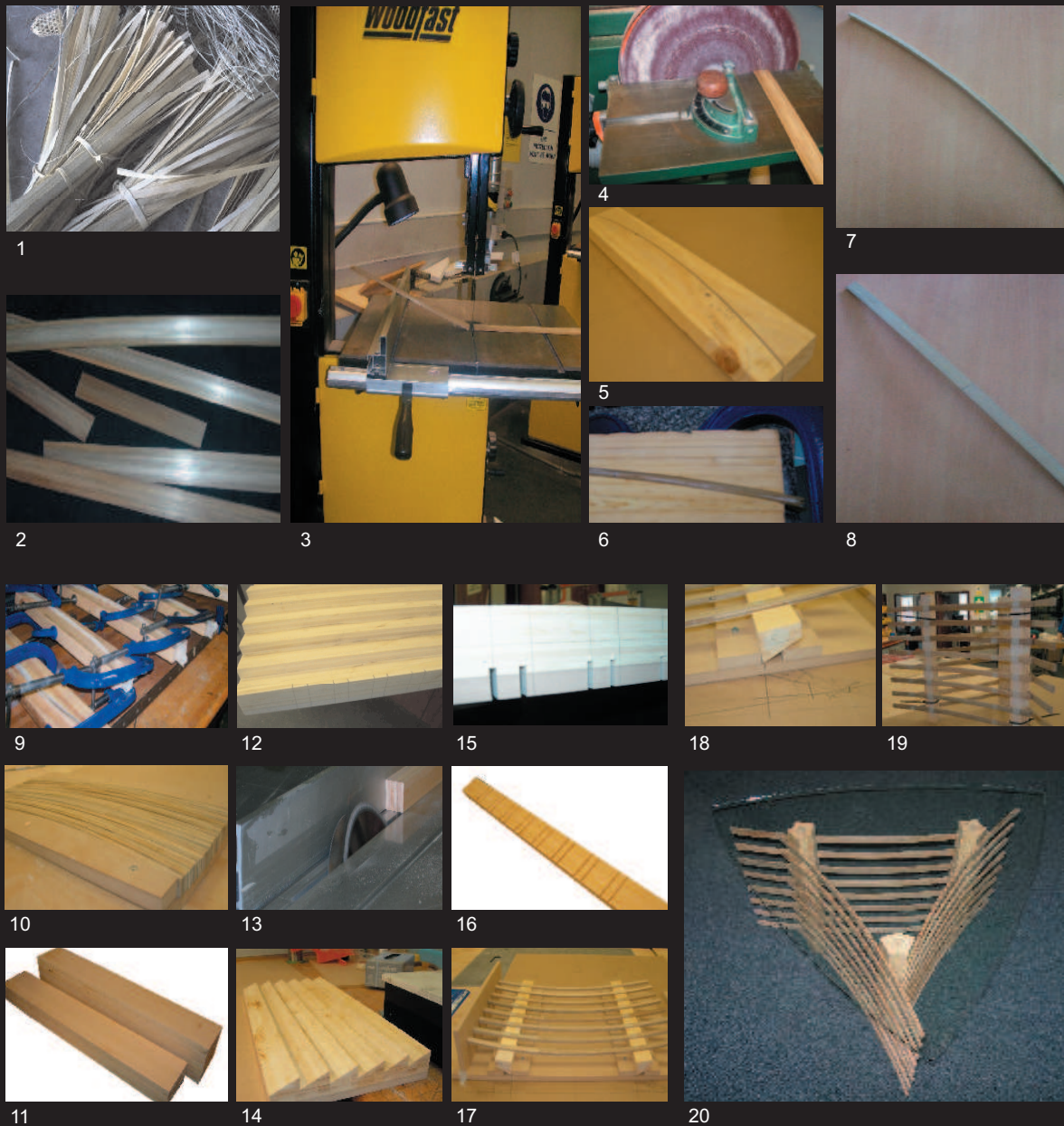
1.a & 1.b. Design of small scale models 1:10

2. 3D Modelling preliminary designs by applying rhinoceros program and making small scale models by applying laser cutter machine.

Workshop experiments showed that the bamboo strips can be easily laminated into strong and lightweight laminated forms by employing modern western laminating and forming technologies. The lamination method was an easy process to implement with access to appropriate machine tools and equipment for precise cutting, trimming and sanding of the laminated forms. The lamination process included the use of clamping jigs and modern adhesives such as PVA glue which increased the strength of the laminated forms to make them suitable for furniture construction. However, the short length of the strips (approximately forty centimetres) meant that a careful approach to the layering of the strips in larger components was required so that the joins were offset in alternative layers.

The above lamination process that was developed in the RMIT workshop was used to create a prototype design of a coffee table. The design process begun with development of sketches, followed by computer modelling with graphic design software which was used to create small scale models from 3mm MDF with laser cutting machines. The small scale models were then used to create a prototype from laminated form of bamboo by using specific woodworking equipment in the RMIT workshop.

When the development of the designs and the prototype of the coffee table were completed in Melbourne, the research was then taken to Indonesia where the complete range of designs was produced by Javanese traditional artisans. The transfer of knowledge of design and furniture technology that was learned in Australia was tested by interpretation of these designs by traditional Javanese artisans. With the combination of modern western technology and traditional Javanese techniques it was aimed to create unique and original design forms and manufacturing methodologies. The intent was to create furniture designs that contained objective value and cultural value at the same time.



- 1 & 2. Bamboo strips as a material source
3. Cut strips
4. Trim strips
5. Mould
6. Clamps system
- 7 & 8. Laminated bamboo for further experiments
9. Glue and clamp bamboo strips of prototyping the coffee table
10. Trim edges of prototyping the coffee table
11. Laminated bamboo of the legs construction of the coffee table
- 12, 13 & 14. The process of construction of legs of coffee table
- 15 & 16. substrates for table legs
- 17 & 18 Attach curved strips onto leg subtract
19. Assemble process
20. End product was done in RMIT Furniture laboratory; coffee table

The knowledge of a craft was handed down, usually in small workshops, from father to son and from master to apprentice; the secrets were family traditions. In all crafts, much of the work involved producing simple and sometimes crudely made items for daily use. But there was also an astounding amount of work devoted to manufacturing items that even today provides examples of the highest perfection in execution and beauty.³⁰

Design investigations with Javanese timber artisans

The last phase of the project involved taking the research back to Java where traditional craftsman were asked to develop techniques to reproduce the prototypes and designs developed in Melbourne. The interpretation of the prototype designs made in the RMIT workshops, through the traditional Javanese craft skills and their techniques used in Indonesia, became the core focus of this study. The idea of a 'technology transfer' became the critical framework through which the project unfolded, this transfer occurred through the meeting of Western and Indonesian craft traditions and as a result a new approach toward design and production of bamboo furniture began to evolve.

In order to be able to be closely involved in the prototyping process, an independent skilled timber artisan and several assistants were contracted to prototype the products in the back yard of the designer's house in Surabaya rather than in a furniture factory or artisan village. This method gave more opportunity to observe in more detail the making process and allowed for close collaboration with the artisans and the control of timing, work sequence and supervision.

Asking an independent artisan to create craftwork at a specific site or place of residence is a common method implemented in Indonesia. While the skill base and craft knowledge is handed down from generation to generation in workshops within the artisan's villages, single artisans in their twenties and thirties who do not have family responsibilities to consider are free to travel and be contracted at specific sites. In this case a more mature artisan was contracted, however more time was allowed for the artisan and his assistants to travel back to their village on a regular basis.

The laminated bamboo construction techniques that were developed at RMIT were introduced to a number of traditional Javanese artisans, which raised key issues regarding the transfer of technology between cultures. Firstly the lamination techniques were not well recognized in either traditional bamboo weaving or furniture making. These techniques were however understood by Javanese timber artisans who are familiar with their application in various timber species in producing architectural elements in houses. Ultimately an artisan with general timber knowledge was chosen to develop the laminated design ideas rather than others who had knowledge of specific bamboo or timber furniture construction techniques.

The research was complicated as the use of bamboo as a material for lamination was unknown to the woodworking artisans. However as bamboo is a native material that is cheap and easy to find in Indonesia the selected Javanese traditional artisans had sufficient knowledge and skills to apply to the use of bamboo as a substitute for timber in the production of the furniture pieces.

Initially the artisans were sceptical about the idea of using the strip bamboo to create curved forms. However the prototypes produced at RMIT provided authentic evidence of the success of the technique and proved to the artisans that this was not an impractical research for them to do. In working with the craftsman, various trials were conducted to translate the techniques achieved in Melbourne with modern machinery, into techniques that embraced traditional timber artisan's skills and knowledge. The methods implemented were not expected to yield exactly similar results as at RMIT but rather the goal was to develop new ways in which the traditional craftsman could approach the use of bamboo.

The traditional artisan's had limited availability to modern equipment and technology as what they worked with they brought with them. They are more familiar with traditional tools than the use of modern machinery. The equipment used in the prototyping processes in Java, were tools such as hand saws, paper saws, pendulums and hand drilling machines.

The laminating process with inner bamboo strips as the raw material was the biggest innovation of this research. Implementing the laminating process was an important part of the transfer of modern techniques into traditional craftsmanship. Rather than the use of laser cutting machines or a bandsaws to produce the formwork for laminating, the artisans hand cut these forms using traditional saws and rather than the use of clamping jigs the craftsman developed binding techniques with pieces of string that would lash the strips of bamboo together during the drying process. The glued and laminated bamboo was spread out in the sun to dry to ensure the laminations would dry in the humid tropical environment and to preserve the laminated pieces from the attack of insects and fungus. During this process it was discovered that laminating bamboo in different seasons, such as the dry and wet seasons, could also cause variation in the quality of the bamboo material.



1



2



3



4

1. Sawing with a hand saw to produce moulds in East Java, Indonesia
2. Sanding paper to trim the raw material
3. Traditional pressing and drying processes
4. Planing the raw material into a precise angle

The joining techniques used in constructing the pieces in Java were compromised by the fact that the craftsman had no access to clamps. This resulted in furniture with structural joints that are perhaps not as strong as those made in RMIT and which required more cleaning up and detailing. Instead of clamping the craftsman would pin dowelled and glued joints with nails. The nail head would then be cut off and punched below the surface. The implanted nail was then covered by a mix of glue and fine bamboo particles and polished using sandpaper. Finally, the object was finished by using a water based varnish that retained the beauty of the natural bamboo surface.

The transfer of knowledge obtained from modern techniques used at RMIT furniture laboratory to traditional artisans was a key aim of this research. As the communication and comparison of the different approaches was the important issue in adapting the techniques used in Melbourne in order to develop new and innovative techniques for construction in Indonesia. The role of affective communication between the designer and the Javanese timber artisans in transferring the ideas for prototyping the designs became a crucial aspect of the process.

There was several communication methods used during the development of the design prototypes. As many of the artisans were illiterate this research implemented several strategies to develop forms of communication for the successful transfer of design ideas. At first a communication technique was implemented that showed the timber artisans the design in plans and elevations. However, it was found that they were able to interpret the end product easier by looking at the three dimensional drawings as a complete shape rather than by two dimensional drawings.

However, the designer felt that working drawings were more important than the three dimensional drawings because they explained in more details the required shapes, measurements and construction methods. This problem led to an altered strategy of developing two dimensional and three dimensional drawings at the same time. These drawings were supplemented with photographs that had been taken in the RMIT furniture laboratory of the processes involved in making the original laminated bamboo coffee table prototype. These photos were used as communication tools to allow the traditional timber artisans to understand the making process step by step. In addition numerous explanations and interpretation of the text in the drawings a high level of supervision was required to oversee the work that was being performed.



1



2



3



4

1. Trimming edges of laminated bamboo
2. Making precise measurements by using a pendulum in traditional artisan's work
- 3 & 4. Assembly process in East Java, Indonesia

Another issue was that the craftsmen have a cultural mindset that does not appreciate a female as a controller for such a project. This was a small problem that occurred in the first stage of developing the communication between the craftsmen and the designer. However being confident, direct, tough and patient at the same time was the key to the successful communicating of construction and design strategies.

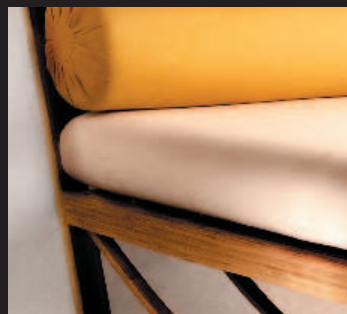
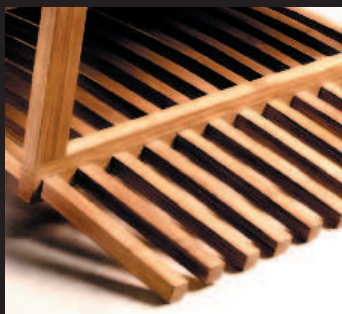
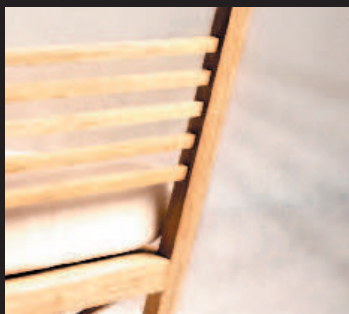
The main aim of this research was to encourage the use of bamboo in a wider context as a potential raw material for the manufacturing of contemporary furniture in Indonesia. In order to do this it is clear that a designer's knowledge and the artisan's skill must find ways to blend together to create modern and original works. The restriction in use of modern equipment provides both an advantages and disadvantages in this environment. With the combination of traditional equipment and artisans skills it is possible to produce high quality furniture at a reasonable price, however the by hand processes of traditional artisans are considerably slower than the operations performed by machines, this would lead to a decrease in productivity over time or with larger orders. Also the quality of the end products would not be expected to be consistent as end products produced by modern machines. Quality control is an important cycle-process in ensuring that traditional manufacturing achieves the best quality and quantity at the same time.

In this research modern technology and construction techniques were used to develop new ways of using bamboo, this knowledge was then interpreted by the traditional artisans using age old methods. Potentially the next step on from here would be to begin to introduce modern machinery and equipment into the artisan's village workshops to increase the speed and quantity of production. Such a development would have to be considered with great care as it would require a substantial financial investment, an upgrade of village workshops and factories and the implementation of training for young artisans. Most of the artisans with high skill levels are around forty years old or more who would find it difficult to accept new and different methods of manufacturing. The concern of introducing modern machinery amongst the traditional manufacturing would perhaps be a loss of the age old traditions.

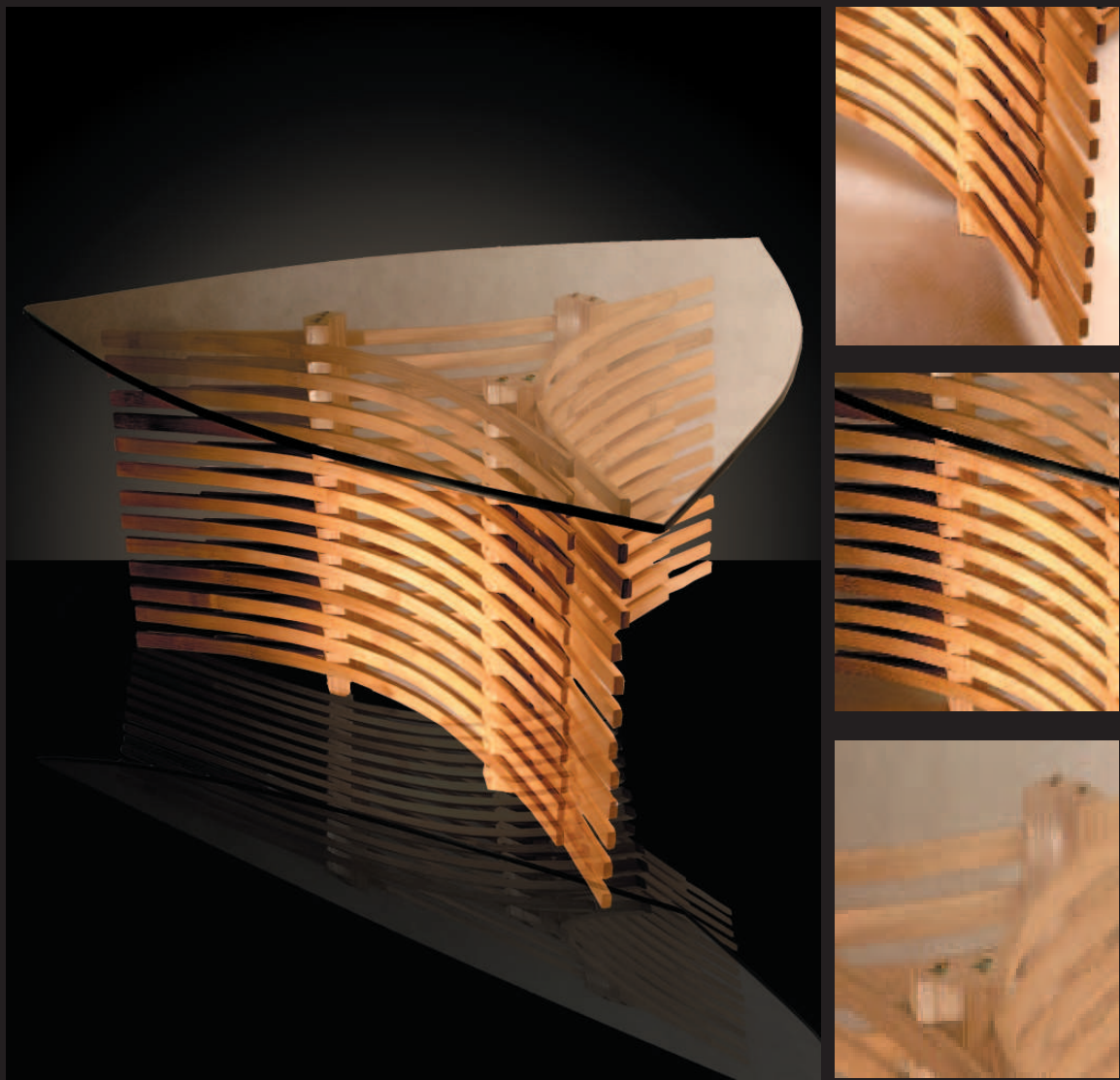
The damaging results of modern industrial practices that focus on mass production leads to the production of unnecessary and wasteful designs for the consumer. Papanek has criticised practitioners of industrial design for wasting both natural and human resources on the design of unnecessary dangerous and environmentally harmful products.³¹ He notes that the result has been a design profession that conforms, performs, deforms and misinforms rather than one that informs, reforms and gives form.³² Rather than replacing traditional craft with modern techniques it is felt that the application of traditional craft skills to contemporary design in ways that maintain the cultural legacy of the craftsman is a more realistic and sustainable approach. Any introduction of new technology needs to adapt with the artisans working environs and run parallel with the traditional artisan's skills.

The project has emphasized many issues within the concept of knowledge transfer during the process of making the furniture prototypes by Javanese timber artisans. Most importantly it has highlighted the need for an appropriate and sustainable approach toward the technological, educational, cultural and social aspects that a designer must consider when they work with traditional communities in the production of contemporary design. The role of teaching, facilitating and participating in the process of prototyping with the aim of increasing the ability of the artisanship is a key aspect.

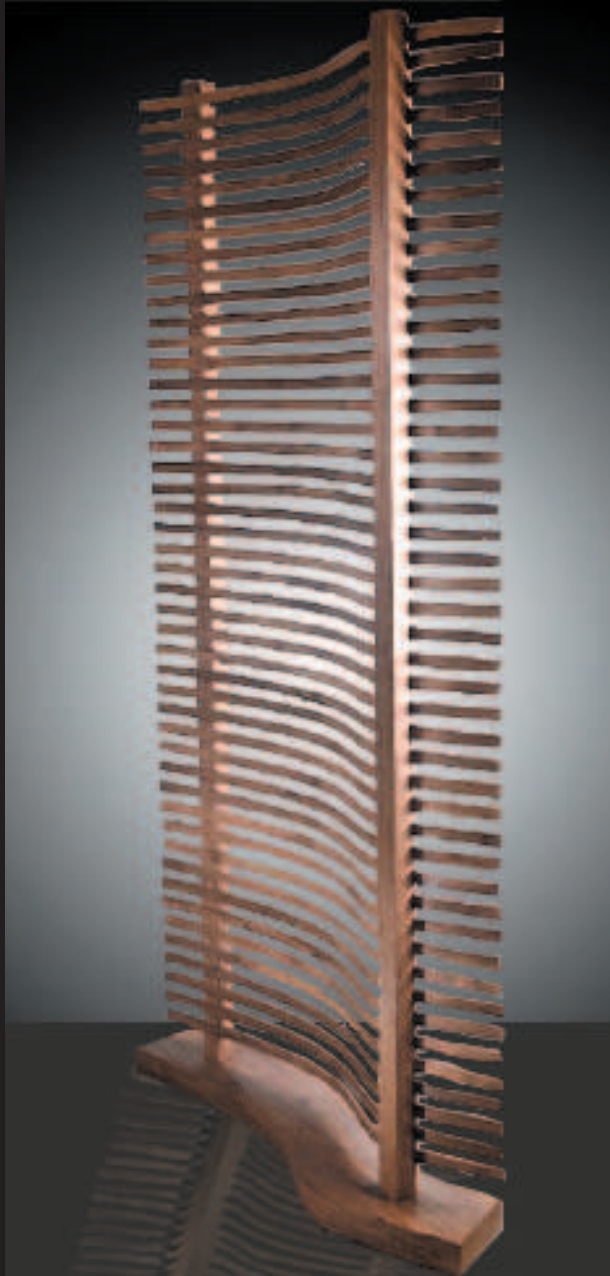
In this process, the knowledge transfer is a two way process and one that engages all parties in the act of problem solving and design thinking. In this way of working the finished product becomes the result of a collaboration of equals who develop a mutual respect for each others expertise. While basic design knowledge and technology gives guidance and directions to a variety of new and innovative design initiatives it is necessary to understand that technological development must not advance without good reasons. Engineers without Borders believes the designer must be aware that "education has the power to develop and strengthen the capacity of individuals, groups, communities, organisations and countries to make informed decisions in favour of sustainable development."³³



Double seated couch prototype



Coffee table prototype



Room divider prototype



Contemporary bamboo furniture prototypes

The project included the design of three contemporary furniture pieces as an expression of the cultural hybrid between Javanese culture and contemporary lifestyle. The design process was used for exploration and understanding of the potentials of craftsmanship, traditions and native materials and how they may be combined together with technological innovation and shifting aesthetics of the modern world.

Conclusion

The project was initially conceived as a way of encouraging the use of bamboo in a wider context as a potential raw material for use in the manufacturing of contemporary furniture. It was recognised that the use of laminated bamboo has the potential to fundamentally change the furniture industry's dependence on timber resources. While this key issue of the use of a sustainable and plentiful material source still lies at the heart of the investigation, in its undertaking the project exposed a number of other important factors that inform the role of designers working with traditional communities. Within the project the design process has been used for exploration and understanding of the potentials of craftsmanship, traditions and native materials and how they may be combined together with technological innovation and shifting aesthetics of the modern world. In this sense the design and prototyping of the furniture pieces were the instrumental tools in the conducting of research into traditional techniques used by Javanese craftsmanship.

The project highlighted the differences in knowledge and approach that lies between Western manufacturing and design and traditional Indonesian craft and making. In attempting to traverse this divide through the development of contemporary design that utilise local Indonesian materials such as bamboo and local Indonesian skills the project has highlighted a number of issues essential for such an exchange to take place. The key aspect of this process is developing a trusting working relationship with the craftsmen and developing communication techniques for the sharing of information, as the ideas developed by designers usually look to extend the boundaries of known practice and techniques. In the project this involved convincing traditional timber craftsmen to work with bamboo waste product and to develop alternate techniques to reproduce the results of the laminating and joining of the bamboo components that were originally completed in a fully equipped workshop in Melbourne. In this process the attitudes of the craftsmen changed from initial scepticism to the development of a new found confidence and pride in the fact that they had become more creative during the prototyping process and developed a new technique for clamping laminated plywood through the use of plastic and rubber ribbon to bind the glued strips.

In its undertaking the project has exposed issues surrounding the role of the new generation of Indonesian designers who are educated in the west but who then return to their homeland and wish to engage with the local natural and human resources available to them. In this situation the contemporary designer's role needs to go far beyond creative design thinking based on market demands or to merely copy styles and techniques from the western world. Rather the responsibility of contemporary Indonesian designers is to consider that their designs and products are managed to meet the social, economic and ecological sustainability for the future generations. Good design is seen as an act which preserves and conserves the indigenous potencies of craftsmanship, values the identities of distinctive cultures, and views material as a precious resource.

This master's study was undertaken from my position as an Interior Design lecturer at Sebelas Maret University, Surakarta, Central Java. In this position I see my role as one which is vested with the responsibility of researching, developing and teaching ways of how designers may work in Indonesia. In doing this project I have established a future agenda for my academic career that focuses on developing a deep understanding of the role of design, technology and craftsmanship in Indonesia. The themes of this research suggests further research collaborations and deep investigation from other researchers in various fields such as agriculture, engineering, marketing, sociology and art theory. Such studies would help play a role in the bridging of the traditional and contemporary worlds and how local resources such as bamboo can be used in both environmentally and culturally sustainable ways.

Notes

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